USFS-USGS Climate Change Project (funded through the NCCWSC)

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Overview: The Southeastern U.S. spans broad ranges of physiographic settings and contains a wide variety of aquatic systems that provide habitat for hundreds of endemic aquatic species that pose interesting challenges and opportunities for managers of aquatic resources, particularly in the face of climate change. For example, the Southeast contains the southernmost populations of the eastern brook trout and other coldwater dependent species. Climate change is predicted to increase temperatures in the south and is likely to have a substantial effect on extant populations of coldwater biota. Thus, aquatic managers are tasked with developing strategies for preserving coldwater dependent biota, such as eastern brook trout, and for providing new conservation opportunities in ecosystems that will be transitioning from cold or cool-water ecosystems to warmwater ecosystems.

Project Goal: This is a joint-project with the US Forest Service to develop integrated tools that allow natural resource managers to develop and evaluate strategies for minimizing the effect of climate change on aquatic ecosystems and related ecosystem services. There are two concurrent studies, one in the Pacific Northwest addressing the effects of potential temperature and flow fluctuations due to climate change on salmon, trout, and chars and this project, in the Southeast, that is focused on climate change effects on cold-water species and ecosystem services.

Deliverables: The Southeast study will be done in the mountainous portions of the Upper Chattahoochee and Roanoke River Basins and includes the following major products:

- Maps for spatial-overlay analyses of measures of conservation actions and ecosystem services associated with watersheds.
- Comparative models of climate-change effects on stream fishes using occupancy dynamics along thermal gradients in the Upper Chattahoochee and Upper Albemarle-Pamlico Basins.

- Sensitivity analysis to indentify additional data needed to have the greatest effect for reducing prediction uncertainty and improve management decision making.
- Reports documenting results of the investigation.

Timeline: This is a two-year project that began in the third quarter of FY 2010 and will continue for two fiscal years, FY11-12. The final report with products will be due in September 2012.

Year 1

- Compile existing and collect new temperature data for calibrating water temperature models.
- Develop datasets for surface water dynamics and geomorphic characterization; test remotely sensed geomorphic classification with field data.
- Develop integrated cold-warmwater stream fish metapopulation dynamics models.
- Develop databases for testing alternative hypotheses for mechanisms structuring aquatic biota assemblages in relation to landscape and climate changes.
- Refine the definitions of current ES capacities and flows; choose metrics of the capacity of ecosystems to produce ES and of current conservation actions that are amenable to mapping.
- Map current patterns of ES capacity, ES flow, and conservation actions.

Year 2

- Develop and parameterize stream temperature models.
- Assess the adequacy of the integrated cold-warmwater stream fish metapopulation dynamics models.
- Assess model sensitivity to differing sources of uncertainty and identify key uncertainties for future study.
- Complete assessments for priority fish species under climate-change scenarios at the two study areas.
- Analyze spatial relations among current ES capacity, ES flow, and conservation actions,
- Develop future scenarios based in part on climate change projections.
- Prepare findings for publication